G. H. Parmelee.

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NEW ENGLAND

Journal of Dentistry.

VOL. II. AUGUST, 1883. No. 8.

ORIGINAL COMMUNICATIONS.

FURTHER CONTRIBUTIONS ON THE SUBJECT OF DENTAL CARIES.

BY W. D. MILLER, BERLIN.

[Read at the Union Meeting at Springfield, June, 1883, by Dr. W. C. Barrett.*]

I. CARIES OF ENAMEL.

Up to the present time, investigations concerning the parasitic nature of dental caries have been confined chiefly, we may almost say exclusively, to a study of its phenomena as seen in connection with carious dentine; but as at least nine-tenths of all the cases of caries which come under our treatment necessarily begin with enamel, the value of careful observations on the caries of that tissue cannot well be overestimated.

The difficulties attending the preparation of slides of carious enamel are vastly greater than in those of dentine, because in the former the tissue becomes so frail that it falls to pieces during the process of grinding, while the method of treating carious enamel with acids and making razor sections, would hardly be adapted to a study either of the chemical or parasitical character of the carious process.

I have nevertheless succeeded in obtaining one hundred and fifty

*Reprint from *Independent Practitioner*.

microscopic preparations of carious enamel, from over one hundred and twenty-five different teeth. These sections were all stained with some aniline dye, and mounted in Canada balsam. Neither enamel nor dentine in a healthy state can (with the exception mentioned under V) be stained with any of the aniline dyes of which I have made use. On the other hand, both enamel and dentine which have been acted upon by acids, may be readily colored.

This fact often furnishes a very valuable and sometimes the only indication as to whether any change in the structure or composition of the enamel has taken place.

In the beginning of the carious process we find on the surface of the enamel a slight depression, or concavity, which may or may not contain Leptothrix buccalis in considerable masses. The border of the enamel will be slightly tinted with the coloring matter used in staining; beyond this, to the depth of perhaps fifty micrometers, the enamel will almost always be very perceptibly discolored, as though acted upon by some agent, producing effects undistinguishable from those of acids.

In such preparations we must search a long while before we find anything which in any degree justifies the conclusion that the caries is entirely and solely dependent upon the presence of fungi.

In one case, where a considerable portion of the whole periphery seemed to be more or less carious, appearing in various places uneven, and discolored by the dye which had been absorbed, I saw some of the spaces between the enamel prisms apparently distended and filled with something which looked like micrococci. As this something had not been stained at all, the case was rather doubtful.

In another instance, where the enamel was discolored to the depth of about one hundred and fifty micrometers in such a manner as to leave no doubt that a change had taken place, I saw very delicate funnel-shaped excavations extending into the enamel for about ten to twenty micrometers, and apparently containing micrococci. With one or two other exceptions of like nature, I have not found in any of my preparations of this class a single instance where even the interstices of the enamel prisms had been penetrated by micro-organisms.

In a second class of preparations, we find the enamel entirely destroyed for a certain space, and the caries encroaching upon the dentine. As soon as the enamel is broken through, the caries extends rapidly in a direction at right angles to the dentinal tubules as well as

parallel with them. Here is a very marked distinction between the action of the agent which produces the softening of the dentine and that of the fungi; for while the former appears to advance with about the same rapidity in all directions, the latter travel very slowly in any course excepting one parallel with the tubules, since they can escape from one tubule to another only through the very narrow and tortuous branches of the tubuli.

This conclusion is fully confirmed by an examination of instances like that cited above, where that part of the softened dentine which is still protected by enamel will be found to contain very few fungi, or none at all.

The walls of enamel on each side of the cavity frequently show a marked discoloration (brownish yellow) extending to a depth varying from a few micrometers to one-fourth of a millimeter; in other cases, an equally broad zone is seen to be distinctly stained by the dye used in preparing the specimen. In such instances, the paucity of the micro-organisms is often so great that one must search very carefully to find even a few lying along the margin or in the fissures of the enamel. Within the enamel itself they do not appear to be present, and a regular advance of the invading organisms beyond or up to the boundary between normal and diseased enamel, seems to be entirely out of the question.

As one result of my study of caries of the enamel, I have been led to the belief that after the enamel has once been broken through and a cavity of decay formed, the destruction of the remaining walls of enamel takes place chiefly from within outwards, rather than from without inwards.

This, which we may call the internal caries of enamel, is somewhat less difficult of examination than the caries of the external surface.

Take for example a molar tooth, extensively decayed on the grinding surface; slightly enlarge the opening in the enamel, and it will be found that the bond of union between the dentine and enamel has in some places been ruptured. Remove as much as possible of the softened dentine with one stroke of a spoon-shaped excavator, and the surface of the enamel will, to a greater or less extent (depending upon how far the caries has progressed), be seen to be covered with a layer of white, amorphous powder, exactly resembling both macro- and microscopically, that which is formed on the surface of a piece of enamel which has been for some time immersed in acid, or in a mixture of saliva and bread.

Examined microscopically, it will be found to consist of enamel prisms either single or in bundles, of from ten to one hundred and fifty micrometers in length. This powder is sometimes half a millimeter in thickness. Remove the surface of the outer layer, repeatedly purifying the instrument by fire, and using the most scrupulous care to avoid bringing any kind of impurity in contact with the deeper parts; take then a portion of the powder lying on the border of the healthy enamel, stain and mount it in Canada balsam, and you will be astonished to find that there is not only an almost complete absence of micro-organisms where you might have expected to see them in great numbers, but that the enamel is also entirely free from any signs of infection, either between or within the prisms.

In one preparation, by diligently searching for three minutes, I found one bacillus and two bacteria; in another, I hunted for five minutes before I found a single organism. Microscopic sections ground from enamel decaying on its inner surface frequently show, by the readiness with which they take up the dye, that the enamel, to the extent of one-half m. m. or more has undergone a softening process. But we look in vain for a corresponding invasion of the fungi. The dental fibrils on entering the enamel often become very much expanded, forming oval or spindle-shaped excavations in the substance of the enamel. If the caries of enamel proceeds from within, these cavities readily become filled with fungi, and the zealous seeker after these organisms would no doubt at once jump to the conclusion that they had eaten a hole in the enamel.

I have one preparation of carious enamel in which a very limited number of micrococci appear to have worked their way between the enamel prisms along the course of the enamel fibers, a fact which, however, signifies very little, as I have shown in a previous number of this journal. As a summing up of what has been said, I will state that from a careful study of over one hundred and fifty preparations, I am driven to the conclusion that there is as yet no sufficient ground for the assumption that micro-organisms play any more than an unimportant part in the caries of enamel.

II. CARIES OF CEMENT.

The comparative infrequency of caries of cement compared with that of dentine or enamel, the consequent difficulty of obtaining suitable material for examination, the fact that normal as well as diseased cement becomes to some extent tinged by the aniline dies, and

the absence of any characteristic form in which caries of cement presents itself, combine to make this tissue far more difficult of examination than either the enamel or dentine.

Although I have more than thirty specimens of caries cementum, I have not been able to arrive at an opinion sufficiently conclusive for presentation here. I therefore leave this subject for the present, with the remark that I am not now prepared to present any proofs in favor of a pure parasitic caries of cement.

III. CARIES OF DENTINE AT NECK OF TOOTH.

The outermost layer of dentine at the neck of the tooth is either normally without tubuli, or they are so fine as not to furnish so easy an entrance to micro-organisms as the tubuli of dentine in general. We therefore find in this region caries manifesting itself in a form somewhat different from that presented by dentine in other positions. It is, moreover, here alone that we may readily obtain specimens of caries of dentine in its incipient stages.

A specimen of this kind, examined under the microscope, usually shows on the outer border a zone consisting of indistinguishable masses of fungi, from which project numerous threads of Leptothrix buccalis. Below this comes a zone of infected dentine, which is seen to be traversed by numerous triangular cracks or fissures, having their bases at the periphery, and apices at some point beneath the surface of the dentine; in other words, the section appears as though it had been notched by a triangular file. These notches are almost invariably found to be filled with fungi, chiefly micrococci. Whether these fissures were produced by the fungi, or whether they resulted from a contraction of the outer layers of the softened dentine, or from some other cause, and afterwards became filled with the fungi, remains to be determined.

Below this zone of what we may call infected dentine, comes a zone of softened, non-infected dentine. Sometimes this is of considerable depth, while in other instances the fissures appear to extend almost if not quite up to the boundary of the normal dentine. In some cases, the transition from the softened to the normal dentine is so gradual that it is very difficult to say just where the boundary lies. In a great many, however, it is so abrupt that one may mark the limit with the greatest ease, a zone of deeply stained dentine being immediately followed by one of perfectly colorless tissue, so that one may draw a curved line through the preparation, and say, On one side is normal; on the other, softened dentine.

This applies not only to that at the neck of a tooth, but to dentine in general, and is a fact hard to reconcile with the germ theory of caries, since in all the preparations which I have examined with reference to this question, I have met with very few cases where the boundary line between the infected and non-infected parts is not of the most tortuous and angular nature conceivable.

IV. CARIES OF DENTINE.

To what I have already written upon this subject in the January number of the *Dental Cosmos* and in the May number of the *Independent Practitioner*, the following may be added: I have made some hundreds of sections of carious dentine, and over two hundred I have treated with various reagents and mounted in Canada balsam. These preparations (unless made from dentine in the last stage of decay) invariably show tracts varying from a small fraction up to one-half of the whole section, which are almost, and sometimes completely, free from micro-organisms. Viewed in this light alone, the idea that softening of the dentine is produced by fungi penetrating the normal dentine and first consuming the organic part, appears to be doubly wrong—first, because the fungi which should have consumed the organic portion are not there; and, second, because the organic matter which should have been consumed is still present, or at most, has suffered less than the inorganic portion.

The same fact may be exemplified in the following manner: Thoroughly cleanse the cavity of a freshly extracted carious tooth in which the pulp is not exposed, remove the softened dentine, repeatedly changing the instrument used for one purified in the flame of a spirit lamp or bunsen-burner, until you have come to the boundary between soft and normal dentine. Then with a spoon-shaped excavator remove a quantity of fine shavings or scrapings of this dentine just on the border, stain and mount in Canada balsam. If the operation has been carefully and cleanly performed but very seldom will any of these shavings contain fungi.

A question in practice is suggested by the following case: A patient comes with a tooth containing a large amalgam or gold filling, made five, ten or more years ago. The filling was inserted over a living pulp, which afterward died, or as frequently happens in Germany, over a dead pulp. An abscess followed and a fistula was formed which has been active at intervals throughout the whole period of ten or more years. During all this time there was probably not a moment

when a microscopic examination of the contents of the root-canals would not have revealed great numbers of fungi under conditions of moisture and temperature very favorable to their development. When, therefore, we remove the filling and find no signs of caries in the root, we wonder what those organisms have been doing all these years if, as it is asserted, they are capable of devastating whole rows of teeth, and undermining the best made fillings in the space of a few months. Evidently there is a limit, and we may say with confidence that not all fungi are sufficient to destroy teeth. This is not an imaginary case, but one which I have met with time and again, and one which I think every practitioner must now and then encounter.

V. PARASITES IN NON-CARIOUS TEETH.

Under this heading I wish to call attention to certain forms met with in the tubuli of perfectly healthy dentine, which may lead us to diagnose fungi when there may be none present. Examining a section of molar tooth in which the cavity of decay was separated from the pulp by a layer of dentine one-half a c. m. thick, I found on the side of the pulp cavity farthest from the decay, within the dentinal tubuli, something which presented every appearance of micrococci, bacteria and bacilli. Had these tubules been on the side of the pulp cavity, presenting the decay, I should not have hesitated a moment to put them down as such. Under higher powers, however (zeiss $\frac{1}{18}$ oil), the micrococci appeared to have an uneven, irregular contour, while the bacteria and bacilli instead of having roundish ends, sometimes appeared pointed, or as if cut across diagonally, and in some instances I saw shapes which did not correspond with any form of fungus that I have ever seen. The tooth from which the section was taken contained a living, healthy pulp. The part of the section containing the fungus-like forms was slightly stained by the dye, the intensity of the color being greatest near the pulp cavity and extending in some places quite to the periphery of the dentine.

Since that time, in nearly every section of sound dentine, from perfectly sound teeth which I have examined with reference to this question, I have found similar figures, especially the coccus-like form. If these are really fungi, we need no farther proof of their harmlessness than the fact that such sections show no evidence of caries whatever. If, on the other hand, they are not fungi, we are in continual danger of setting down as such things which are of an entirely different nature.

H. Morgenstern, dentist, of Berlin, described at the last meeting of the Central Verein deutscher Zahnarzte, certain forms which he had found in senile teeth, or such as had become loose from absorption of the alveolus. He believes that he has found either fungi or algæ in such teeth. Whether these are the same as the forms above described I cannot say. It is significant that he finds them in that class of teeth which is least of all subject to caries.

The case teaches us that it may not be allowable to set down as fungus every little round or oblong thing which we see in a slide.

The points in this communication to which particular attention is directed may be summed up as follows:

(1.) Aniline dyes react upon enamel which is attacked by caries in the same manner as upon enamel softened by acid. A participation of fungi in the first stage of the carious process is not observable, although a slight invasion of the diseased enamel appears in some instances to have taken place.

(2.) Caries of enamel, advancing from the inner surface, reduces the tissue to a fine white powder; sections of such enamel usually show micro-organisms only in the parts where the tissue is completely broken down, while with a proper amount of cleanliness, considerable quantities of the powder may be obtained which is completely free from fungi.

(3.) Softened dentine taken from the surface of the normal dentine appears as a rule quite free from infection.

4.) The softening of the dentine advances with almost equal rapidity in all directions, while the invasion of fungi goes on much more rapidly in the direction of the canaliculi.

(5.) The boundary between the normal and softened portions of dentine is often perfectly distinct and sharp; it is impossible, on the other hand, to draw the boundary line between the infected and non-infected portions.

(6.) The mere presence in the canaliculi of something which resembles, or even actually is, a fungus, is not proof that the thing in question is a cause of caries.

In conclusion, it may be said that the germ theory as tested by the microscope, apparently falls short of furnishing complete explanation of the phenomena of dental caries; that fungi, even when reinforced by acids, do not in all cases prove themselves sufficient for tooth disorganization.

There appears, in many cases at least, to be some other element at

work. Investigations in the direction indicated by Prof. Pierce in the *Dental Cosmos* for March, or by Prof. Abbott, ought to throw some light upon this point.*

NECESSARY FOUNDATIONS FOR THEORIES IN DENTISTRY.

BY CHAS. MAYR, A. M., B. S., SPRINGFIELD, MASS.

[Read at the Union Meeting of the Massachusetts and Connecticut Valley Dental Societies, held at Springfield, June, 1883.]

I expect there are but few among you who have not become convinced that dental theories are much more than mere playthings; that, without them, one is adrift on the ocean of guessing; and no matter if one adheres to a right or wrong theory, as long as one has enough of a theory as a guide to shape one's course, every one feels a kind of satisfaction in the profession—a love and zeal in it. Without theories and speculation, the profession would be a dreary waste of money-making devices.

I have been at many meetings, but, gentlemen, it is my conviction that no class of professionals show such a zeal in the study of their special branch—we may except perhaps the opthalmologists—as the dentists.

Not long ago I met a doctor who said he did not believe in dentists! From the drift of the discussion, I had to infer he did not believe that they had any thought except that of drawing teeth, plugging holes and pocketing the money. I felt a great deal of satisfaction in showing him that his particular branch of medicine was much less studied and worked out, and based on scientific principles, than dentistry. It is true, if dentistry consisted in nothing but mechanical work, dentists could not claim any more consideration than other nice mechanical workers, like jewelers, glass-polishers, electroplaters, etc.; but just their love for real knowledge, their ardor in the investigation of the whys and hows, have raised them to a standard which makes doctors jealous — fortunately only the ignorant ones. I think that there is no class of men—perhaps excepting the reverends—where cheek and imposition plays such an important part of the professional skill as among the physicians. There is a great body of as conscientious men as can be found the world over among the physicians, but there is a body almost as great whose whole stock in trade are a few

*The second paper presented to this meeting by Dr. Miller, and read by Dr. Barrett, may be found, substantially as read at this meeting, in the July number of the *Cosmos*.—ED.

Latin words, the capability of writing badly in bad Latin a prescription not intelligible to the laymen—and cheek, immense cheek.

But why do I give this introduction? Simply to show you what I consider the most important factors which will raise dentists and dentistry above the level of the mere mechanic: namely, theoretical knowledge, speculation, theories and a practice not based on rote, but on a certain more tangible basis than simply the advice of somebody else.

While we therefore may very well agree as to what will elevate the dental profession, as soon as we look over the field to observe how this works in detail, we meet with the most diversified and not always satisfactory results.

We do not realize enough how immense nature and how immense the amount of complexity is in such a little object as in a tooth. But a complete knowledge of all the details of a tooth is as essential to a complete theory as a knowledge of all the details in the course of a planet is to the problem of calculating its position for a hundred thousand years hence. The latter problem has been solved to satisfaction, but not to perfection; but, in regard to a tooth, we are still at a pitiable state of childhood in knowledge. Why that? Because we know so very little surely about the fundamental facts concerning a tooth. These facts we can group into three classes: anatomical facts, biological facts, physiological and chemical facts.

Anatomical facts: What do we know, and what do we not know? We know the grossly mechanical structure of a tooth; we know that it consists of enamel, of dentine, of a pulp, of blood vessels and nerve threads. If we advance further by means of the microscope, doubts begin already to gather. We know that the enamel consists of peculiar rods, that the dentine consists of canaliculi, that the pulp has on its surface "odontoblasts," as they are called. But, further, our knowledge becomes dimmer and dimmer as our magnifying power increases. We learn things only in a general way. We do not know the exact details of the arrangement of the canaliculi; the question of a communication between two canaliculi is hardly yet settled. The existence of living tissue in the canaliculi is still a matter of dispute; a little further, and we arrive at the border land of knowing and seeing. We know that the bioplasson threads extend through all the canaliculi of the tooth; but how are they constituted? Here we have arrived in Unknown-town. We do not know the detail of the structure of the tissue between the lime crystals; we do not know

the detail of the bioplasson threads; we know the whole structure of a tooth only in a story-telling way, but not in a scientific way. We will know it in a scientific way when we will be able to apply figures to all of these things.

If we knew of the planet Jupiter only the fact that he moves around the sun in a very complicated manner, that he seems to follow the course of an ellipse, but beyond that, we should not know anything, we could not say much about the probable position of Jupiter thousands of years hence. Just so in teeth. So long as we do not know the law of the canaliculi in an exact sense, so long as we do not know the law of the strength of the fibers in the canaliculi, we know but very vague things about the tooth. Further, the tooth has a pulp; the microscopy of the pulp has not yet gone beyond the gaze of the primitive man at the starry sky. All is still a kind of fabulous story of a man who has been in foreign countries.

If we listen to the microscopist, he tells us his discoveries like the first navigator who saw an island surrounded with coral reefs, another one that bore cocoanut trees and beasts as huge as mountains, etc.; but they did not know anything about size and exact positions, etc.

Thus the microscopist talking about the dental pulp, still is forced to tell us vague stories of connective tissues, afferent and efferent vessels, odontoblasts; but the exact detail of their structure is still totally unknown. We know that "connective tissue," as we call it, abounds everywhere; that a nerve twig goes to the brain, but we know nothing of the details of the nerve twig. Its course is only roughly anatomically known. We cannot follow it up in the brain, do not know its connection with the great sympathetic system, and know hardly anything about its existence.

You see the list of our not knowing vastly surpasses that of what we know, and as long as that is the case, it seems to me the duty of every dentist, who is a microscopist, to take a special subject which he will investigate with all his power. Say, one takes the structure of the enamel. How shall he proceed? It might perhaps be immodest to try to give advice, but it is not at all an advice; it is only a suggestion: Let the microscope be absolutely first-class; by former experience we know already that we want the very best defining power, with magnifying powers of at least one thousand diameters.

Second, how shall we treat the specimens? Now here I know I will meet with great opposition.

First of all, *let us not abuse our microscopical specimens.* We must

make preparations of the same enamel with the most different chemicals. We must make them under the most different methods of grinding and mounting, and then we will get a collection of chemistry of the enamel.

I have heard some microscopists say: "We do not want to look at lime-salts," and it was said in a tone which made it appear as if some really important and smart saying had been made. Gentlemen, he is an absolutely unscientific investigator who does not want to look at lime-salts; he is a playing child, but not an investigator.

The tooth is not canaliculi and bioplasson alone; it is also lime-salts. And if your razors do not cut the lime crystals, well, we will have to devise other methods of preparation; but by all means let us look at the lime-salts too. We want to see all. Only by thus specifying his work, a dentist will accomplish anything. He will have to make hundreds of preparations of enamel, first, to ascertain the effect of the different treatment; then, after he has arrived at certain results concerning the chemistry of the enamel, he will proceed to utilize his knowledge to bring out the details. He will begin with the apex of the crown; he will make a great number of sections from the same tooth, commencing at the crown and going down to the neck of the tooth; he will not reject one section. He thus will see the change in the enamel and the adjoining dentine. By this method we will obtain a clear knowledge of the details of the enamel. Perhaps his studies will lead him to the use of a microscope with three or five thousand magnifying powers. That is the way, I imagine, we have to get at the basis.

In chemistry it is being done, and will result in time with a theory of chemistry which will allow us to attack the bioplasson in the rear while the microscopist attacks it in front. The same thing will have to be done with the dentine, the pulp, the cementum, the germs, the alveolus, the nerve and its ending in the brain. Only then will we get the foundation on which we can build safely. But this is only the anatomy.

Next comes the *Biology*. What do we mean by that? It is the study of the development of the tooth; of the changes during the development; how the structure of the tooth stands in relation and connection with the structure of the same tooth in the mother and grandmother, in father and ancestors. We must know how circumstances have interfered and do interfere in this direction. The microscope will be our great guide. The biological point of view is in fact as immense as the anatomical point.

Next to it is the *Physiological* aspect, and this is as poor as the rest in regard to our present knowledge. We know nothing at all about the physiology of the tooth except that it has afferent and efferent vessels. We know certain conditions of its aching, but its nutrition, its supply, are wrapped in utter darkness. The physiology of its growth is far more unknown to us than the belts on Jupiter. Dental physiology is absolutely "naught" in all its meaning. We can only establish facts in physiology by specializing in the most refined manner our task. We must submit developing teeth to the most varied experiments; we must make the most divers preparations of teeth; we must study the effect of light, of heat, of mechanical irritants, of irritants applied at the brain on the development of the tooth, but all this must be done in a most scientific spirit.

I will not discourage you any longer with a list of what we would like to know. If the proverb of a fool asking more questions than ten wise men can answer, should be applied me, I am afraid Northampton would not prove big enough for me. But the pointing out of deficiencies is the first step toward correcting these deficiencies. The science of dentistry has only begun to dawn; we have begun to investigate; we have got some results. Let us stand by them and defend the ground once gained; but let us not think that this is the last of it. Supposing a man accepts the conclusion that what we term germs are necessary for the decay of teeth, he meets with many questions which he can answer but vaguely, because the fundamental facts are so entirely lacking. We have only seen the low organisms as our ancestors saw the flea. The flea was to them one of the smallest animals existing. We know that the flea is an elephant, an Atlantosaurus among the world of creatures that has been discovered. Under the microscope, we have found a most complicated structure in the flea. So, I do not doubt, we will find still a very fine structure in the micrococci: diplococci, bacteria, etc. But we will not have to be satisfied with microscopes that magnify only one or two thousand diameters. We will have to get instruments of many thousand diameter's magnifying power, etc. Will we get them? Only the man who knows but little would dare to answer, No. No one has arrived at the end of things and at perfection. We are as far from perfection as Cicero was when he supposed the arteries to be air tubes conveying air through all the body. Our theories have become more and more microscopical, to speak so; but probably a thousand years from to-day people will laugh at our microscopical ignorance as much as we

laugh at poor Cicero and his ignorance. We settle more and more the coarser facts, but we soon arrive at a border line, where we will be just as much at "loggerhead" as Aristotle about the action of the heart. I believe that we will get microscopes of almost infinite magnifying power. I do not wish to discourage, but to show the necessity of going for the latest. The old is always and necessarily more imperfect than the new; improvements are made everywhere. Compare the beautiful drawings in Dr. Heitzmann's book with the childish cuts in Frey's book, with only a few years' difference.

But one thing I would like to say: Let us not waste our time and efforts in isolated attempts which necessarily will be fruitless. If a man with a microscope mounts to-day a bee's sting, to-morrow a beetle's tongue, after to-morrow a dental pulp, he appears to me like the boy who is playing billiards every day; he has no settled plan; he likes to make a shot, and feels proud if successful. With all his playing he will never find out the laws of the balls, or anything else about it, if he does not direct his experiments in a certain scientific manner. The success attained in such isolated play-work with the microscope may be pleasing to the one who does it, but the satisfaction of having accomplished something will be lacking.

Let us hope that some members will find time to give their full attention to one small subject of interest to dentists, and let him investigate that alone, with a view to know everything knowable about it. Only thus will we have real progress and real advancement.

A NEW WAY TO SECURE LOOSE INFERIOR INCISORS, ETC.

BY J. HARDMAN, D. D. S., MUSCATINE, IOWA.

A case: Mr. B., an intelligent farmer, aged about 55, had a very loose right lateral inferior incisor, caused by waste of alveolus from calculi, etc. The teeth were close together, and worn blunt, and this one was elevated one-eighth of an inch above the rest. The patient could vibrate the point in an arc one-third of an inch to and fro, and the annoyance had become unbearable.

Finding, upon inspection, that the teeth upon either side were quite firm, I discouraged extraction. Patient concurring in my advice and plan of treatment, I proceeded at once to operate.

1. Cut off the end of the loose tooth to a level with its neighbors.
2. Drilled a hole one-half line in diameter directly into the end of

the crown, about one-eighth of an inch deep in this and the tooth upon each side.

3. With a one-fourth-inch circular saw (which was also used in cutting off the end of loose tooth) in engine, I cut a fissure transversely through the end of this tooth as deep as the hole, which it crosses, extended the fissure to the same depth in the teeth upon each side, but only to the center hole, and of the side next to the loose tooth. I now had a fissure or slot extending from the hole of the right cuspid through the end of the right lateral incisor (the loose tooth) and into the hole of the right central incisor.

4. A stiff bar of silver plate, cut about one-eighth of an inch wide, and long enough to reach from the hole of cuspid tooth to the hole of central incisor, and through the fissure of the loose lateral, and with each end folded upon itself was adjusted to lie snugly in the fissures, so as to form a yoke extending through and connecting these three teeth.

5. Anchored this yoke-bar by placing some soft amalgam in bottom of slots first; put bar in position, and by a few taps with a small hammer brought it home, and finished the anchorage with harder working amalgam.

This case has been inspected since doing good service for months, and is indeed proving very satisfactory to the possessor.

It may be in place here to state that silver for the yoke and amalgam for anchorage were chosen in this case, because of the close approximation of the teeth—but little surface liable to oxidize and be in sight to mar materially the appearance in the mouth. A few days subsequent to the insertion it was dressed and polished, and use will continue to keep it nice while it lasts.

If the amalgam used be strong, non-contractible, and in every way good, satisfactory results may be confidently anticipated. The bar may be made of gold or platinum, and the anchorage may be done with cement or amalgam first in the bottom of the slots, and then finished with cohesive gold—making proper retaining surfaces both in tooth and cross-bar. It is quite evident that this plan of support may be applied so as to secure even the entire four incisors by anchoring them to the cuspids which usually remain firm so long.

If the teeth are *not very loose* or *sore*, they can be operated upon at once; but if quite movable, some means should be resorted to to keep them steady during the operation. Plaster-of-paris or gutta-percha has been recommended. I find a sufficient agent in a strong

waxed linen thread or twine—beginning sometimes as far back as a first or second bicuspid, to which it is firmly tied around the neck, then continuing to tie tooth by tooth until all are secured to a firm one upon the opposite side—care being taken not to draw any out of natural position. Yet, in certain cases, the ligation may be so managed as to bring any too projecting incisors sufficiently back into line. A fine soft iron or copper wire may be used in lieu of the twine, either of which can be readily cut and removed after the completion of the operation.

One of the almost indispensable implements used in this operation is a nicely running circular saw, of about one-third of an inch in diameter, for cutting off the ends of loose teeth, and making the slots, etc. They are (when of varied sizes) also quite useful in cutting out fissures in crown cavities, trimming edges, cutting out old fillings, etc. If not obtainable from the dealers of the proper desired sizes, they may be readily made from the handles of broken separating files. Draw the temper by heating and cooling very gradually; drill a hole (which may be squared with a fine file point) and cut as circular with snips and files as you can. Make a shaft out of iron wire to fit your engine (these iron shafts are convenient in many ways), and dress the end to fit the disk hole, into which secure it by riveting. Now put it into the engine and true up by running it against a sharp file, corundum, etc. Next put it into the vice and, with a well adjusted and hard chisel, cut the teeth by even taps, one tooth behind the other, shifting the little wheel in the vice as required until completed. Then put into the engine once more, and true the teeth where needed; then temper by heating upon charcoal and, when quite red, drop into water.

A half-dozen of different sizes can by a little experience be very soon made in this way, and may be re-sharpened by drawing the temper and using a fine-edged file, when the temper may be again restored as at first.

To resume: In cases where the ends of the teeth are too thin for transverse fissuring for receiving the yoke-bar into the ends of the teeth, a shoulder is cut with the circular engine saw, upon the labial surfaces of the teeth, say one-twelfth to one-eighth of an inch down from the cutting edge for the lower edge of the bar to rest upon, while it lies snugly against the teeth. Then a fissure is cut down through the cutting edge with the saw or file extending antero-posteriorly nearly down to the shoulder, and large enough to receive a pin, and so shaped that the pin may be well anchored therein.

If the ends of the bar are to extend to the cuspids or bicuspids, provision is made to anchor these by cutting dove-tailed slots or orifices suitable for the purpose of anchoring these ends. Now an impression with wax or modeling composition may be taken, and the patient dismissed for a time. The model thus obtained will do to adjust the yoke, which may be made of platinum or gold, or gold alloyed with platinum, and pins of the same soldered at the correct points to the bar, so as to nicely lie into the slot in each tooth, while the bar lies in position, with properly formed heads or retaining notches, and the ends of the bar doubled upon itself (or other approved way) to favor firm anchorage, etc. The patient is now recalled, and the appliance is in every way adjusted to meet the desired end. When all is ready, the anchorage may be done with good amalgam, or it can be done with gold. I prefer the former, as I think that in most cases it can be done better, quicker and, if care is taken in packing and dressing up after it is hard, it will look quite well and do longer and harder service than gold.

In this plan of resting the yoke-bar upon and against the lingual surfaces of the ends of the teeth, a hole through each tooth, in lieu of the antero-posterior slot, may be practicable, and a neater way. (And it may be done without impressions or models.) The bar being adjusted after the holes in the teeth are drilled and properly countersunk or under-cut, with a sharp pointed instrument the bar is marked opposite each orifice as a guide where to put the pins. These pins are readily secured to the bar by riveting and soldering, some notching upon the pin for anchorage upon the part that must lie within the orifice, and the pin left long enough to project so as to be flush when dressed up. Anchorage may be done with oxyphosphate of zinc, or any good cement; but without doubt the most reliable way would be to anchor with amalgam, and especially so, in anchoring the ends of the bar in the firm teeth.

The great advantage in applying the support at the *points* of the teeth is quite apparent upon a little reflection. The waste of alveolus has been greatly accelerated in these cases by the irritating movement of the root pressing unduly against the borders of the alveoli, keeping the absorbent process too active. And the same condition, to an extent, prevails where the support is placed at or near the neck of the tooth. As in those cases the points of the teeth are found turning outward—force upon the points in mastication doing this, while the root is at the same time forced unduly against the inner part of the socket border and causing an increase of waste there; the middle support acting as a pivot or fulcrum; making it evident that such a plan can give but temporary relief compared to the mode here presented.

EDITORIAL.

SOMETHING ABOUT ALCOHOL.

The July number of the *Ohio Journal of Dentistry* contains an article by Dr. H. W. McClellan, on Alcohol. The author is too much in the word medicine; he fights about the naming and classifying of alcohol, whether stimulant or narcotic. All of these classifications in medicine into stimulants, sedatives, expectorants, narcotics, etc., are very handy for practical use, but considered scientifically, they give only *one* single property of the drug, which in every case is very complex. The fight about these words seems to us still less valuable than that of theologians about their forms of fetishism. The question of the action of alcohol becomes so very complicated by the fact that most observers entirely overlook, that it makes an enormous difference whether an ounce of alcohol be taken absolute, with 30% water (whisky), or with 10% (wine), or 5% (beer), or 3% (cider); if it be consumed all at once or in intervals, etc. One ounce of alcohol, of 100%, taken at once, may prove a most powerful narcotic poison, but one ounce of alcohol, taken during the day in the form of teaspoonfuls of wine, may prove a good and genuine stimulant. Hammond has made very fine experiments, which proved very satisfactorily that moderate quantities of alcohol first prove what must be fairly called a stimulant—that only the after reaction is narcotic. "Alcohol is in no sense food," says the author. Well, to go to figures: The French cities have a kind of pavement tax which is levied upon all kinds of food brought in to them by teams. This allows a statistic of the consumption, and if Dr. McClellan will compare the figures, he will see that those cities which have the greatest wine consumption have the least bread consumption. Though this may depend on other factors, yet it goes a trifle in the way we always considered alcohol in the economy of the body, namely: Taken in small amounts and slowly, it is burned in the lungs just as fat and sugar, and thereby supplies a certain amount of these. As one kilogram of alcohol gives about 7,000 metric calorics or heat units, it replaces about three-fourths of a kilogram of fat. Unfortunately its caloric effect is very soon counterbalanced, if taken too strong, by the nervous depression following its use, so that while in small quantities it is a useful caloric food, in larger ones this useful quality is destroyed by its action on the nervous centers. There is a point of equilibrium between the two, and the

problem is to keep the effect of the alcohol restricted to the calorific effect. According to experience and experiments, from one ounce to perhaps ten ounces a day may be burned up in the body, if introduced slowly and uniformly. The lungs burn up many a substance which does not form a normal constituent of the tissues, and yet gives heat. Dr. McClellan says sugar is found in the body. May be, but only grape sugar; yet we eat hardly anything but cane sugar, a distinctly different substance, and it is burned up. Acetic acid, etc., etc., are all eaten, though not found in the body, and they are all burned up, supplying heat.

The editor of the *Ohio Journal* hitches his own fire-cracker of "I told you so," to Dr. McClellan's article. We should hesitate to accept this exclusiveness. We disbelieve thoroughly in the use of alcohol by a healthy man without need, but under circumstances, everything from a homicide to strychnia, alcohol, milk, and a beefsteak, may be a blessing or a curse; only the human intellect can be our guide.

A LOOK INTO THE FUTURE.

The gold supply of the world is put at about $200,000,000 every year. About $1,000,000 worth of this gold is put into the teeth of people, and as this gold is almost invariably lost from further consumption, it might not be quite uninteresting to inquire if that is right, from an economical standpoint. It will of course not make a great difference to us at present what becomes of the gold. The supply will be sufficient for our wants and those of our children; but the question may come up, do we not do something wrong against future generations, following us, by burying every year about two tons of gold in the teeth and finally in the earth. It is the worst use we can put the gold to, to throw it in the ground.

In very many, and even most cases, it may not be worth taking the gold out of a tooth of a corpse, but after all it is a serious loss to our wealth. Gold is considered at present as an equivalent of work. One ounce of gold represents the hard work of a mechanic for about ten days. This means that we throw away uselessly every year the value of the work of an army of 2,000 working men for an entire year. We do not know any better way of storing up work and its value than gold or precious stones. The question under consideration is, therefore, not only one of simply losing a few grains of yellow metal, but one of wastefully throwing away the saving of a large

amount of labor. The labor of this army of workers is perfectly wasted, if we do not preserve the gold. As a further point of consideration, there comes up the supply of gold. We know it is limited. California will not furnish gold for twenty more years in quantities to count. The gold supply of Australia will probably be exhausted in some thirty years. What then? The outcome will be that the gold will either disappear entirely, or will attain a value which puts it outside of the reach of wasteful dentists and jewelers. Thus demand and supply will equalize themselves. Silver will have to take the place of gold, and a general upsetting of a relation of trade for some years will follow. We do not have unlimited wealth on this globe of ours, and wastefulness will be sure to find its punishment. It will be the same with petroleum, coal, etc. The children of a wasteful generation will have to pay the fine.

Gold fillings at present ought to be much higher than they are, considering the political economical wastefulness implied in the use of this metal. If dentists could fill teeth with iron, there would be no danger of the supply getting exhausted; but all over the world the gold market is already in a trembling, nervous condition. The demand far exceeds the supply, and only by the combined efforts of the different gold-coining governments, can an artificial standard of the value of gold be maintained.

A DENTAL JULES VERNE.

In the *Ohio State Journal* of July, 1883, there is a very curious paper by Dr. Watt on *Helps in Study!* There occurs the strange sentence: "Now, do we need microscope, balances, reagents, etc., to settle this question? (namely, as to the existence of the varieties of decay.) Certainly not." (!!!!!) Why, doctor, you are too clear-headed, you have done too much in the profession to believe that statement of yours! If Jules Verne travels 20,000 leagues under the ocean, or makes his journey to the moon, or in the balloon across Africa, then he does it without the use of scales and similar measuring instruments. Has Dr. Watt, in his theories about decay, arrived at that point? Now they become intelligible to us; now we have the key! "Truth, simple, pure and bright, is found only in this way." That is what Dr. Jules Verne Watt says at the end of his article. Doctor, you are too smart and learned for such enunciations as the first above we quoted from you. It did not grow with you; it comes, as Dr. Atkinson would say, from the bottomless pit of darkness and ignorance.

PRACTICAL THINGS!

"Practical things are what we want. Give us formulæ, give us advice pressed into a nut-shell; make a pill out of it that we can swallow blind, so that we can have sleep." That cry is only too often heard from what are so-called practical men. They think they are a peculiar sort of people. They do not give themselves to dreams! They despise such things, but they know what is needed. Beware of such men. They are generally lazy hunters after the crude dollars—too lazy to think, too lazy to have an opinion of their own. They are the men who will hire another man for $3,000 a year, call him a minister, and make a kind of contract with him that he is to do all their thinking for the whole year. He has, so to speak, to chew their intellectual meat for them, and to digest for them the truth of their denomination. A man who is not able to draw his own conclusions when a theory is presented to him, or a certain fact is established, is not fit to call himself a rational being. We have very rarely found anything at the bottom of the cry after formula except laziness, indolence and stupidity. The man who tells us the way in which to solve a certain problem, is far more useful than the man who does the problem himself and makes us copy it. We will learn much from the first, but very little from the last. The spirit of the musing philosopher is not such an unpractical spirit, after all. To whom do we owe nine-tenths of the progress in modern organic chemistry? To the dreaming, abstruse Germans. But when it comes to the question of who will have the most dollars, then very often these so-called practical, but really only unscrupulous men, who wish to get the essence of years of work without paying a penny for it, are often the most successful. Quite a number of our correspondents want practical hints, some without even subscribing to the *Journal*. Now, if we should know anything that is practical, out of mere spite we would not give it to such a fellow. Every laborer is worth his pay, and if a man gives the result of perhaps many years' experimenting without some kind of remuneration, here in America we may very properly call him a fool. A great deal of our patent law fights are between the men who want to get somebody's invention for nothing, and the poor fellow in self-defense who fights for the offspring of his brain. Never encourage the unscrupulous stealing of "practical men."

Several of our old subscribers have failed, thus far, to send in their "enclosure" for 1883. It may be *you*. (?)

DR. MILLER'S ANALYSES OF DECAY.

In the July number of the *Cosmos* is the paper of Dr. Willoughby Miller, of Berlin, read at the meeting of the two societies at Springfield, June, 1883. The paper contains a great amount of analyses. We only regret that the "artificial caries" was included in some of those otherwise really valuable experiments. The calculation of a reduction of the lime-salts from 72 to 59%, to correspond to a loss of $\frac{13}{29}$ or 44%, is made under a few hardly admissible suppositions. First, that the normal dentine from which these masses of decay were taken had 72% of lime-salt. We just doubt that very much. Decaying teeth are mostly not teeth with the highest amount of lime-salts, but with lower percentage of it; if we only suppose 71%, the loss is 41%; with 70% of lime in the original dentine, the loss is 39%, etc., variations of more than 11% among each other, etc. The second supposition, perfectly inadmissible, is that the organic matter, water retained at 120° C., etc., have remained the same. These calculations become very different when we take the water into account. Teeth in the mouth are never dried at 105° C. (221° Fahrenheit), and then exposed to the action. The general results of our analyses (*New England Journal*, January number, 1883), agree very well with those published by Dr. Miller. The average of the two analyses of layers two and three is 56%, or exactly that of Dr. Jeserich. My outer slice gave somewhat more than the similar analysis of Dr. Jeserich, but the identical figure with the softened dentine. Thus the results of my analyses have only been confirmed by those authorities. What Dr. Miller says about "absolutely perfect manipulation," is untenable. With "absolutely perfect manipulation," we cannot and never fail to get absolutely perfect results, only we never have absolutely perfect manipulation. We know that 10% error is very easily committed, but it depends on the kind of analysis and the aim, if 10% is "absolutely fatal to the analysis." Among chemists I will give you a specimen of an excellent analysis which nevertheless is even 25% wrong in one constituent (H), and 5% in the other (C).

C	3.2	ought to be C	3.05
I	96.7	" " I	96.70
H	.2	" " H	.25
	100.1		100.00

The substance, as you well know, is Iodoform C_2I_3H. For the purpose in view, the analysis is excellent nevertheless; thus an analysis

even 10% wrong may be excellent under some circumstances, while it may be worthless under others. While my conclusions and those of every one may be erroneous, the figures of my analyses and those of Dr. Miller agree very closely, and show unmistakably that a larger amount of lime-salts is left than e. g. exists in normal bone; and while bone with 54% of lime-salt is healthy and hard, dentine, with 59%, and in some cases 65% of lime-salts, is dead and soft. There is the point! Dr. Miller in the paper, as read by Dr. Barrett, expressed his surprise at the large amount of lime-salts present in decay and, as we think, justly. The final "questions to be determined" in Dr. Miller's paper are very illustrative: "What other agents besides acids assist in the process of decalcification? Do bacteria produce a ferment capable of decalcifying or softening dentine?" Dr. Miller promises further researches; they cannot be but valuable. But let us not forget that whatever acids may do, they do not produce *caries*. They may soften some dentine, but that is no caries yet. They may dissolve lime-salts, but that is only abrasion. We do the same when we eat pickles, sour kraut, etc. But that does not give us caries. There is another more important factor than acids in producing *caries*. A scratch of the skin is very different from a pimple; a pustule is very different from a cut, though the scratch or cut may become a pustule or gangrenous. Caries, when once developed, is a gangrenous or putrefactive process in the dentine, which putrefactive process, we claim, is impossible without lower organisms. Before that putrefactive process has set in, it is as improper to call an abrasion by acids caries, as it would be to call a scratch a gangrene.

SOMETHING ON "CHEMISTRY OF DECAY."

Our readers may enjoy a little side-show. While at the Union Meeting at Springfield, we took short-hand notes of Dr. Niles' paper on Chemistry of Decay, which notes appeared in the July number of our *New England Journal;* the paper itself appeared in the July number of the *Cosmos*. If they compare the two, they will be surprised at their close resemblance. The notes and our report were not intended to be verbatim; they were intended to be used on the spot; but they are a fair rendering of the paper. They show to the profession the need of verbatim reports. A meeting with such reports is far more interesting than a report where every member can afterwards look over what he and those after him said, and correct it accordingly. A

few errors crept in, from the fact that in absence of the stenographer somebody else had to read the proof. Some curious but otherwise indifferent misunderstandings may be noticed, like nitrate for citrate, etc. At a few passages, Dr. Niles—not unfairly—corrected errors in his paper, as in the *Cosmos*—see page 214 *New England Journal of Dentistry*, foot note, and page 354 *Cosmos*, for 1883. There is a passage in the paper as read in the *Cosmos* which was not in our short-hand notes, though it may have been read—perhaps because it did not then seem to us necessary for the completeness. Dr. Niles says: "The scientific editor of the *New England Journal* should also tell the dental profession the modus operandi of testing for acetate, lactate and citrate of lime in carious teeth without the use of litmus." Doctor, with all respect of your chemical ability, this time your pen has run away with it. You ask how to test for those salts without litmus. Can you test for them with litmus? Are they not neutral, or, if anything, slightly alkaline. How can a neutral substance in a mixed liquid in the presence of acid salts be tested for by litmus? You say, decay reacts acid. I admit it. Your tests have proved that to me, though I think your tests were at the surface of the decay. Alkaline or neutral salts in the presence of the possible acid phosphate of the formula $P_2O_8Ca_2H_2$—perhaps even $P_2O_8CaH_4$—which you yourself suggested, and whose existence I consider probable at the outer layers, cannot be tested by litmus. You know as well as I that this is not possible. Well, I have asked Dr. Watt, who talks so much about lactates, etc., how he proved them, but he has not told it yet. Acetates, etc., you know yourself how to test for—about 3% of an acetate in a liquid may be found by the iron test, if very carefully made. Citrates I doubt if ever exist in teeth, their easy decomposibility renders it very doubtful. We have no very good test for it. They would have to be isolated and proved by ultimate analysis or measurement of the angles of citrate of lime, etc. The same is good for lactates. But all these organic lime-salts are soluble in water, and in my cases I found no soluble lime-salt at the innermost layer. I of course found them at the outermost layer, but there they prove nothing; they are of as little importance there as the leptothrix buccalis, which sometimes forms an almost velvet-like layer. The solubility of lime-salts in water is characteristic for many hundreds of organic acids, and only few—most of them highly improbable—are not soluble. The most common insoluble organic lime-salts are the oxalate, stearate, oleate, tartarate, etc. But as oxalic and tartaric acids are no products of fermentation, their existence in decay is probably not claimed by those who consider the acid process as most important in the production of decay. M.

[Thinking that there are too many good points in this *private* letter to remain private, we give it in full, with the author's consent.]

DR. STOCKWELL:

Dear Sir—Many thanks for your kind letter; have not had time till now to reply. In your note to my abstract, you say "there is no caries until the putrefactive process is inaugurated," &c. If this is so, or will be accepted as true doctrine, then the battle is won for "bugs."

Cohn says: "Putrefaction is a chemical process induced by bacteria." Therefore, I say, no bugs—no putrefaction, no caries! Putrefaction—plenty of bacteria, plenty of caries! The need of a short, concise definition of caries is more and more apparent, and some of the theorists had better hold up till this peg is set, and it is known where we are to start from. As you say, it would save much useless blundering. But what can we expect? Many dentists look upon a tooth as an "ivory plug" set in the jaw, much as a cedar post is set in the ground, and like it, only acted on by external causes, taking no note of the provisions made for the nutrition of the parts, and showing by their practice that physiology did not enter into their list of studies. And, on the other hand, when our Professors will lecture twice a week from September to February on the "cell doctrine," and crowd into one lecture the subject of the nervous supply of the teeth, and matters connected therewith, what can we expect from them in the way of sharp, terse definitions? We have to look to the *workers outside* for help, and let the dreamers sleep on till, like Irving's Dutchman, they wake and find themselves left.

You say "the lowering of the vitality of the structure, or its breaking down, cannot be called caries, but a *favorable condition* to caries." Granted; but I think there is a closer relation between the two than is apparent at first thought—something akin to the relation which irritation bears to inflammation: it is hard to tell where one leaves off and the other begins. I wish you would write at length on this point some time, for it is one I am much interested in. I have no theory to promulgate. I am after facts, and am ready to go where they lead.

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In the March number of the *Journal*, page 78, I find "some interesting correspondence." It *did* interest me, and if we could have a department in the *Journal* where "pegs" may be set up to become "pins" in the lining of our hats, we may all be set a-thinking. I

should be willing to do my share towards finding "pegs" or "pins," as the case may be.

* * *

Have you ever met with a carious condition of the teeth following a severe fever, or in a patient who has used large and frequent doses of bromide of potassium?

I am at work on a series of experiments to find if possible what part, in the production of a "condition favorable to caries," is due to some of our common articles of medicine improperly administered.

Did you ever feel just as though it would do you good to have a real good "growl"? I feel just so now. I have just paid a visit to a young dentist—a young man just from college, and a worthy young man; but he thinks now he has only to wait for *customers*, and I wish I could make him and all others feel as I do on this subject. Every professional man has been obliged to go through this "waiting process," and the manner this waiting is done has much to do with the future of these young men. Text-books at hand, the literature of the profession before them, microscope on the work-table—with these, and a proper sense of the importance of being well prepared for their life-work, any man can hew out for himself a pathway through the throng of men that are fast crowding the professions, and who think, because they have a smattering of the mechanical details of the business, there is no need of more, and wait for patients as the tradesman waits for customers, suffering the golden hours to pass with nothing in the way of facts learned to show for them. To any young man who thinks he has only to wait for customers, I would say, as Longfellow has it, "Learn to labor and to wait." Waiting without labor profiteth nothing; but earnest labor and patient waiting never goes unrewarded. The two years following graduation can be made more valuable to the student than the four years before. He now is able to see for and guide himself, and, knowing his weak points, strengthen them.

I now have in mind a young medical friend who spent the spare hours of his "waiting period" in writing out a syllabus on anatomy and chemistry, with an hour's work each day at the microscope. To-day a Western university is reaping the benefits of that man's devotion to his profession, and to his classes he says: Young gentlemen, be careful of the spare hours of the beginning of your professional life; then will be the time for you to lay up stores of knowledge to draw upon when a larger practice in years to come will leave little time to study."

Would it not be a good thing for the editor of the *New England Dental Journal* to lay out a course of reading for young dentists? Why not get up a dental circle, after the plan of the Chautauqua Scientific Circle?

But enough of this rambling sort of talk, for I have let the pen run as I would my tongue if I were with you, throwing off all restraint, and talking as friend to friend. Hoping that I may hear from you when you have the time,

I am, yours truly,

———

How very different sanitary conditions of certain countries in Europe are as compared with American cities, may be seen by taking a few figures from the statistics from Munich, southern Germany. A shocking fact to a New Englander will be the statistics of births. Thirty-five per cent. of all the children are born out of wedlock. Out of the number of 250,000 inhabitants, 10,000 births occurred during the year, 7,061 deaths, showing an excess of some 3,000 in favor of births every year. Among the cases of deaths, children's diseases predominate by far. Some 40% of all the deaths occurred among those under one year. No case of delirium tremens occurred during the whole year, and that in a city where it is almost a disgrace to drink water. Seven hundred and fifty people in that city were older than 80 years. Among the diseases which proved most fatal to adults are diseases of the respiratory organs, which caused 70% of all the deaths among adults. The high elevation, some 1,800 feet, has much to do with that fact.

Having a larger supply of Volume 1 on file than we desire to keep further, we will furnish, to a limited extent, the entire volume to subscribers, or others, for *one dollar*.

Subscriptions taken for Volumes one and two for *three* dollars. Those of our subscribers who commenced with Volume 2 will, we feel assured, find it to their interest and profit to avail themselves of this opportunity to complete the file of this Journal.

Please send in your orders, gentlemen, at once.

SOCIETIES.

UNION MEETING OF THE MASSACHUSETTS AND CONNECTICUT VALLEY DENTAL SOCIETIES.

[Continued from page 221.]

SECOND DAY, JUNE 7, 1883—*Forenoon Session.*

The early part of this session was given to clinics in crown-setting, by Dr. H. W. F. Buttner of New York, and Dr. H. A. Baker of Boston. Much more than the usual interest in clinics was manifested on this occasion, and both methods were illustrated in a manner that won much praise from an eager crowd that surrounded the several chairs. As soon as the operations were completed, the convention was called to order, and Dr. Baker proceeded to explain his method of crown-setting and bridge work, by the aid of some very beautiful colored diagrams, in a manner that showed him to be a master and expert of the art. A general discussion followed as to methods and details, that was generally participated in by the members. It was noticeable, however, that the largest amount of enthusiasm and confidence in the practicability and durability of "bridge work" in general was manifested by the younger members. This was illustrated by a call from the chair—occupied by the venerable Dr. Searle—for a statement of experience, looking towards results. After waiting for some moments in vain for a response, he remarked that he "heartily congratulated the profession in general, and especially the *public*, that so few had any experience to report." He had practiced it to a limited extent for thirty years, but in a different method from that which is so generally advocated at the present time. By his method, the "bridge work" was removable at will.

Dr. E. H. SMITH, of Boston, defended the practice, and related the results of his own experience in several cases which have proved durable thus far, and promise well for years yet to come; believed the work practical if properly performed, and urged its adoption by the profession.

Dr. GEO. A. MILLS, of New York, read a short paper complimentary of Dr. Riggs, of Hartford.

"UNCLE JERRY" ROBINSON, of Jackson, Mich., was given ten minutes to explain the nature and uses of his new fibrous metallic material for filling and lining vulcanite plates. He took but *five* minutes, however.

Prof. T. H. CHANDLER, of Boston, opened a general discussion on Amalgams. He believes that amalgam is a genuine metal and not a fusion. Stated his methods of testing and using it, and considers it better to use a good amalgam in many cases than to half kill a patient by driving in a gold filling. He absorbs the excess of mercury after the filling is made by the use of pure tin. The use of tin also leaves a whiter surface to the amalgam than would otherwise be obtainable, and does not render the surface soft, as is often supposed. Believes that better results are obtained by using the amalgam in quite a plastic condition and afterwards absorbing the excess of mercury with pure tin than by trying to use it very dry. Better adaptation to the walls of the cavity can be thus secured. Tin should be applied to the surface of the filling as long as it will take up any mercury. His tests show that only two of the amalgams in the market are absolutely non-shrinkable.

Afternoon Session.

The meeting is called to order at 2.40 P. M. by the president of the Connecticut Valley Association, Dr. N. Morgan. First subject: The papers of Dr. Miller, of Berlin (Ger.), read by Dr. W. C. Barrett.

Dr. W. C. BARRETT (Buffalo): I said already yesterday something about the anomalous position I occupy. About two years ago, in Germany, we had the pleasure of meeting Dr. Miller, a true born American, who is as proud of his birth and American citizenship as any one of us can be; and because he lives abroad, that is no reason why we should not consider him an American dentist. Dr. Miller is a young man; he feels that he wants a place in the profession, and it is here where he cares to make a name; it is here, at home, among the American dentists that he wishes to be known; but, being so far away, he is at a disadvantage.

Dr. Miller graduated from Ann Arbor University with the highest standing; from Ann Arbor he went to Edinburgh, and there he pursued his studies in applied mathematics and chemistry under the best teachers to be found. His aim was to qualify himself for a mining engineer. From Edinburgh he went to Berlin, and there he was under the tuition of men like Helmholz, Virchow, etc. There his health broke down; at the same time he became acquainted with Dr. Abbott, whose home is the headquarters of American dentists in Europe. One evening every week is devoted to meetings of American dentists. He was coaxed into the profession of dentistry by Cupid and Hymen; he married Dr. Abbott's daughter, came back to this country, graduated at Philadelphia, and has been practicing since in Berlin.

Dr. Barrett then reads the two papers of Dr. Miller. Our readers will find both of them in our *Journal* at another place. After this, he reads some conclusions of Dr. Miller, not differing materially from what was already stated previously, and gives some of his own views. In concluding, he says:

Not very long ago I was at Cambridge with the purpose of investigating the very large collection of skulls there, especially rich in skulls of aborigines before their contact with the whites and, in consequence, free from syphilis and its consequences. What was the condition of things there? I found the same condition of things that we find in our patients; I found caries in the teeth of the South Americans and the Peruvians; I found caries to exist there most extensively; I found exostosis of the teeth, but only a few irregularities; I found the most extensive abscesses I ever saw in the mouths of patients in my practice,—and God knows I have had bad ones; I found teeth covered with tartar and absorbed to the very apex; I found the results of such diseases as made me pity the men and women who suffered from them (they had no dentists in those days), and the results of suffering from diseases were really astounding. The theory advanced by men that caries is due to our altered manners of living, etc., in fact, to our modern civilization, is erroneous. I was surprised, I was astonished, when I saw those things there.

I have something else of interest that I will show you. There were found in a cave in Mexico six skulls; they are all dolichocephalous; the specimen of a jaw which I am going to show you is that of a muscular man, age about sixty. It was found with fragments of basket and wicker work. There are in this lower jaw two teeth with decay, and it is supposed that these teeth are filled; if this be the case, we will have a record of an undisputed prehistoric filling. I believe that the substance in these cavities is a real filling material. And why? Simply because a substance of the same character was found, which attached the hatchet-head to the handle; it was attached with that cement alone, and that was quite sufficient to hold it in place. It will take a chemist's analysis to positively prove what that was. If this should prove to be an artificial filling, it would be a most important point in the history of filling teeth; food would have decayed long ago. As you see, the cavity is still almost filled with this mass.

Dental Depot journals are quite good, but if we had to depend on them for our literature, it would not be quite so good. The only

independent journals in this respect are the *New England Journal of Dentistry* and the *Independent Practitioner*. Honestly, if we had to depend on the depots for our literature, and the dental manufacturers were to graduate the study, what kind of a profession would we be? They are legitimate enough, I do not argue against them, but we all want rather to be disconnected from the dealers in that kind of work. Every dentist ought to have at least one journal, and you have an excellent one right here at home; but if you wish to subscribe for the *Independent Practitioner*, I shall be glad to receive subscriptions.

Prof. MAYR: As a great number of the polemics in Dr. Miller's papers is directed against the views of my friends and also against some experiments which I made some time ago, I take the liberty of replying to a few points that Dr. Miller makes. The great attention which my few—but I insist as careful experiments as were ever made in dentistry—received, by their being tested by the best authorities of Germany, gives to them more importance than I first attached to them myself. I only made them to disprove certain theories of Dr. Watt about acids and the disputed presence of the lime-salts in decay. I am very glad that my analyses are almost absolutely verified by those high authorities, only I claim that I have made them very much more with a plan of what I wished to prove. The analyses of these gentlemen were made on a collection of decayed masses from many teeth, and therefore give only average results, which in any concrete case must be of little value; but I took one single case of decay, analyzed it fresh in three slices, each of which was large enough to give results accurate enough to base conclusions upon. The details of these analyses you may find in the January number (1883) of the *New England Journal of Dentistry*. I give the figures here:

Outer layer, 39% lime-salts; middle layer, 44%; innermost layer, 67%. Average, 50%.

As you see, on comparing the results of my analyses with those of Dr. Miller's authorities, the agreement is entirely within the variation of averages. When we wish to investigate the origin of decay. the dark outer mass is to us of hardly any importance; we must go to the border line and there, I insist, the amount of lime-salts removed is too small to account for the considerable change in hardness and general appearance of the decaying masses.

Dr. Watt tries to make his readers believe that the decayed masses analyzed by me were not the usual decay, but a rare variety. It is useless to repeat that all the specimens I analyzed were the common

form of soft white decay. I might criticise many speculative points in Dr. Miller's paper. I only will repeat what I have said, perhaps too often for your kind patience, namely:

Whatever fermentation may be able to accomplish, you have no fermentation without germs; furthermore, the action of the acid alone would only cause, as Dr. Stockwell has very forcibly pointed out, *abrasion, but not that putrefactive process called decay*. There is not the slightest proof—nay, even any amount of proof to the contrary—that fermentation or putrefaction is possible without the indispensable action and presence of "germs." If we are beaten on a point in the explanation of the caries of teeth, it is to the benefit of dental science, because we had put up that particular point, not from a mere whim, but on evidence of some facts which have to be either disproved or better investigated in order to force us to change our position; thus, either way, our putting up a theory will result to the best interests of the profession. Already a large literature about theories of decay exists and is increasing daily.

Dr. F. Y. CLARK: I wish to say a little about those micro-organisms. Their object is to reconstruct, to disintegrate, to break up. This holds good with the forest tree as with the animal creation. Nature never does anything wrong and is never wrong. Fifteen years ago, when I knew nothing about these things, I was induced to try some experiments which Dr. Barrett has illustrated here to-day. If you take a piece of ivory, an elephant's tooth, and bore into it, what good will it do? What will it amount to? Not to anything. There will not be found any micro-organisms; there is no animal matter of any kind for them to feed on; I would expect exactly the results which Dr. Miller obtained. But you take an elephant's tooth in the gums and try the same experiment, and you will find very different results. I have tried it repeatedly before I knew anything about these things. In the first case, I have taken the natural tooth in the mouth of a gratuitous patient—I made up for it by other work in his mouth, and he allowed me the experiment. I bored two holes into the right first inferior molar on its buccal surface. I then took a particle of carious dentine and put it in hole number one. I then took another particle of carious dentine, dried it and dipped it in carbolic acid—it was a crude experiment only—and put it in number two. I then filled both holes hermetically. I had to refill number one after nine months. That proves that caries is contagious. After what I have heard here from Dr. Miller, I shall repeat some experiments. If you take a

carious tooth and put it in sterilized water and let it remain there for awhile, and examine the fluid afterwards, you will find something that was not there before. This is the same result which also Dr. Miller proved, and I do not know but we may come out the same hole after all. It proves that carious dentine contains organisms. Now the question arises, where do these organisms come from, how do they get into the tooth, how do they get into the mouth? Tyndall has shown that the dust in the air often consists of 50% organic substance. We breathe them with every breath; they are everywhere. I do not believe that they enter the tooth directly, but they will collect in all the little pits, fissures, etc., where they will find little laboratories, and there they will do their work of entering the tooth structure. First a ferment called microderma vini is there, then follows microderma aceti, and they open the gateway. Thus they get through the enamel. This gateway is sometimes very small—sometimes so small that it cannot be discerned with the naked eye, but they will work up into the dentine, into the tubuli and into the meshwork. What for? Just for amusement? They are not after the lime-salts. What is their pabulum? It is the bioplasson or the liquid contained in the canaliculi of the tooth. They never eat. No one ever saw micro-organisms eat. They do not eat because they have no mouths; they live by absorption; they absorb this fluid, and what is the result? It is disintegration of what we call the structure of the tooth. Another illusion of Dr. Miller's I have to contend, namely, that the micro-organisms have no pigment; I think I am correct in understanding him thus. Now we find in carious teeth a structure which we call micrococcus prodigiosus. In olden times they used to consider a little red color on plants as blood; it was an object of superstition; it is this micrococcus prodigiosus. It cannot be told from micrococci, but it is also in teeth. Dr. Miller has also stated in a former paper that bacterium termo was not found in the carious dentine at all. We know it is a very easy matter to take other organisms for bacterium termo; they resemble each other so much that hardly any one can tell them apart. But we know that without bacterium termo there is no putrefaction. As certain as the sun rises, wherever you find bacterium termo, you will find the odors of putrefaction. You are almost tired of the subject. I am sorry for it, but I feel that there is still a great deal of fighting to do; we have worthy antagonists. Three years ago Dr. Abbott, of New York, stated that the organisms could not be found in caries at all; and then Dr.

Miller came out and proved them to be present; no better evidence has been found, and Dr. Abbott had to give in. There was Dr. Clowes, who has wit and humor. He took the ground that the action of acids on a tooth may be illustrated by putting an egg into vinegar, which will dissolve the shell and leave only the yolk. That was given as the sum total of the subject; but Dr. Clowes has been taking the *New England Journal*, and sometime ago I heard of the conversion of Dr. Clowes to the germ theory. I only want to show that we are a little on the ascendancy, that we are gaining ground.

I wish to speak about another thing. The second Tuesday in August, if you come to Saratoga, we will give you all a cordial welcome and show you the very thing. Now, supposing our theory is correct, what will be the practical conclusions? If you look upon caries as the result of bacteria, then you have an intelligent way of treatment. You can treat your cavities antiseptically, and in so doing you will be astonished at the result. The old theory was to neutralize supposed acids by *alkalis*. I now rely on antiseptics alone. I carry it thus far: If you come to me with a tooth considerably decayed, where there is doubt as to the exposure of the nerve, and if I excavate the cavity, I remove simply the border of decay; I do not care about the floor of the cavity; I will disinfect it; I will put carbolic acid in it or mercury bichloride—one of the best of antiseptics; I put on the disinfectant, leave it over night and then fill the cavity. I have carried on this practice for fifteen years, and if you examine fillings eight or twelve years old, you will find the great majority of them in a normal condition. You will find recalcification.

You are now using the latest and purest amalgam, one that will not shrink, but one of the best is the old copper and silver amalgam. I have one of them in my mouth. It was put in by myself with my fingers. It is one of the best fillings in my mouth. In amalgams, the disinfectant power of the mercury will somewhat come into play, and many of you have seen the bottom of a cavity that has been filled with amalgam, sometimes as hard as flint. That is one of the additional proofs in favor of the germ theory.

We have heard a good deal said about Riggs' disease. I do not know exactly what it is supposed to be, but I have had cases of teeth for a number of years, so loose that you can almost remove them with the fingers. By removing all foreign substance, stopping the collection of pus by antiseptics, using carbolic acid full strength—keeping a glycerine bottle ready to wipe it off if it gets on the lips—and re-

peat it a couple of times, you will be astonished at the result. It is one of the most valuable things in the treatment of the affection; sometimes a perfect transformation takes place.

Now I wish to speak about prophylactic treatment. I accept the germ theory fully, and do not think that anything can yet be said sufficiently strong against it to make me change my views. I discard all kinds of powder. I do not believe that the powders ever did any good to the gums. It may do some good in polishing the teeth. I now use a mouth wash of the following composition:

℞. Carbolic acid, ʒv.
Alcohol, ℥iv.
Glycerine, ℥i.
Oil of peppermint, gtts. iii.
Red aniline, gtts. ii.

Use carbolic acid full strength; take the crystals and put water enough into it to hold it in solution.

Dr. STOCKWELL moved that a vote of thanks of this assembly be extended to Dr. Miller, of Berlin, through Dr. Barrett, for his very excellent papers contributed to this meeting. (Voted.)

Dr. W. C. BARRETT: We see Prof. Mayr roosting several rounds lower on the ladder than we supposed. I supposed he would take the ground not simply that without the presence of germs there would be no decay, but that it was directly and primarily due to the presence of germs. The question is this: Are bacteria the primary agents in the promotion of decay? Now, if this be the case, and this be taken as the issue, Dr. Miller does not agree with him. Bacteria must have the proper fluid in which to propagate. It is not positively settled beyond dispute that they are the primary agents in the production of any disease. Even carbuncle is not settled beyond doubt. I say there are respectable persons, whose opinions are entitled to some respect, who consider candidly bacteria not as the primary cause of the affection, but that they are the scavengers of tissues. When in a pathological condition to afford lodgment, then they step in and favor the production of disorganization and are beneficial rather than detrimental. These views are held by respectable parties. I believe, with Dr. Miller, that bacteria cannot destroy a healthy tooth. Teeth can not be infected with bacteria, as a person may be affected with small-pox—that some other primary agent is necessary to enable them to infect the teeth.

Dr. CLARK: I respect all investigations, but Dr. Barrett, being a

microscopist, knows, and all microscopists are fully aware, that we of all men are more liable to make mistakes than any other class. Some statements seem to me to be almost unpardonable, and I cannot conceive how Dr. Barrett, Dr. Niles, Dr. Miller, or any other man, can say that bacterial organisms are not contagious; that they are harmless organisms; that they are found in all natural food, etc. This is a perfect piece of absurdity. It is not so. I am backed by every authority known.

Adjourned.

Evening Session.

Meeting called to order at 7 P. M., by the president, Dr. F. Searle, of the Massachusetts State Dental Society. First subject: "Bonwill Crowns," by Dr. Bonwill, of Philadelphia.

The very extensive paper, illustrated by many fine drawings and explanations, exceeds the limited space of our *Journal*, and we have to reserve it for some later number. It is a very elaborate and clear affair in every direction.

The second subject on the programme was the paper of Dr. J. L. Williams, of New Haven, on Dead Roots.

Dr. WILLIAMS. *Mr. President and Gentlemen:* When I came here I did not intend to occupy your time very long, and it was also with the belief that I would have some diagrams from New York, which failed to come. It is next to an impossibility to make a presentation of the subject without them. A great portion of the time during the session of the convention has been occupied in presenting the various methods of crowns which are used, and of course the durability of all of them depends very largely, almost entirely, on the physical condition of the roots of the tooth upon which they are placed. Before we can get a clear idea of a tooth, we must know something of the manner of its development. I hope you will pardon me if I speak of the *development of the root.* For this, diagrams are almost indispensable.

The tooth is developed from three sources: from epithelium, from which the enamel organ is derived; the dental pabulum, from which the dentine originates; and the pericementum, from which the cementum comes. The three layers—epithelium—the flat outer, the middle layer with cuboidal cells, and the lower with columnar cells, are the first tissues in the body. The first change is an increase in size of the middle or cuboidal layer of cells, and it causes a rising of the surface

and the forming of a little ridge over the position which the future jaw will occupy. At the same time, the lower or columnar cells drop down and form a cover. After the dropping down of the lower layer, there is developed a little half-shut form, a cap, which is the enamel organ. The enamel organ is filled with cuboidal cells; they are transformed into secretive organs, for which organs the circulation is taken from the plexus of blood vessels around it, so that the enamel organ is entirely distinct and the enamel is independent of the development of a tooth. At the age of nine months, hardly anything is formed but the crown. The roots are hardly developed, and the dentinal germs are concerned in the formation of the crown of a tooth. As the development progresses, the dental pabulum grows smaller, and assumes the form of the pulp; and after completion of the formation of dentine, the pericementum forms from its osteoblasts, or cells, which are identical with osteoblasts, the cementum. The pericementum does not depend on the dentine, so its life does not depend on the dentine; the root of a tooth is not dead, even if the dentine be so, and I question whether there is any evidence going to show that, if the pulp be removed mechanically and without the use of certain agents, as arsenic, the physical condition of the cementum is changed.

After some more explanations which, without the use of the improvised diagrams on the black-board, would not be intelligible to readers, he gave the following method of removing the pulp almost painlessly:

I wish here to describe an operation which is often found useful. I presume it is not new, but it is most successful: Say, a central incisor with pulp badly exposed, is presented, and any attempt to cap it would be insanity, and you wish to remove it; the common method is arsenic. But this method is this: If you must adjust a crown, you cut a groove around the tooth perhaps, if possible, one-quarter way through the tooth; and if the tooth is very sensitive, the operation, if dexterously performed, can be done without any pain. At the same time, the operation paralyzes the pulp. Then you shape a little stick of orange wood to correspond with the shape of the pulp canal; take the orange wood and drive it to the end of the root with one blow. I have done that without the person knowing what was going on, and many other gentlemen can assert the same thing. After this operation, you take a narrow broach, and with one twist, you remove the pulp entirely. Afterwards, it is my practice to use carbolic acid and glycerine which will pass to the end of the root, and drive the same stick into the root, when you have it plugged in the most perfect manner I ever saw. I

have done so in my practice, and it is to my knowledge one of the most successful operations I ever knew. If the pulp is removed that way, the living matter remains intact and, according to a law by which nature sometimes reverses methods of nutrition to parts, I know of no reason, why the continuous integrity, which is retained through the pericementum, may not serve to continue the life of the dentine to a certain extent. But it does not matter; so long as the cementum is retained intact and the processes of nutrition are less interfered with, as it would be in the case of the use of arsenic, I do not see why the attachment does not remain the same as before the removal of the pulp.

QUESTION: Can it be used in bicuspids or molars?

Dr. WILLIAMS: It is much more useful in bicuspids than molars.

Dr. MERIAM: In the second bicuspids?

Dr. WILLIAMS: It is also sometimes successful, but even at the risk of causing pain it is better than to apply arsenic.

Dr. SEARLE: Why do you prefer orange wood?

Dr. WILLIAMS: Orange wood is very compressible, and will adapt itself better, and will fill the cavity more perfectly.

Dr. SEARLE: Would pine be too compressible?

Dr. WILLIAMS: I think not.

Dr. BLAKE: Do you cut the wood as small as the cavity?

Dr. WILLIAMS: I think it would be better to leave it a trifle larger, and to exercise care and judgment not to drive it through the apex of the root, where the former may be large.

Dr. CHANDLER: Can you be sure in this direction?

Dr. WILLIAMS: You never can be quite sure. The success is the only proof of this question.

Dr. ANDREWS: I know a case where a piece of hickory was soaked in creosote and driven home, and eight or nine years afterwards, when the crown had decayed away and the tooth was taken out, I opened the root of the tooth and found the hickory in the pulp cavity still perfect.

Dr. MILLS: I would like to say one word in regard to the operation Dr. Williams described. It seems a strange idea, almost a new idea, but of course there is not anything new among dentists. I recollect, eighteen years ago, Dr. Atkinson spoke of this method as practiced in the West; perhaps Dr. Robinson will remember. He used to tell that hickory sticks were driven against the pulp and left there. It did not pain very much, and he said he had removed the stick

and found the stump living. I have an instance in my own mouth where I had the operation performed. I was skittish about having any one cut into my teeth, and last Fall it was proposed by Dr. Richmond to insert a crown in the lateral incisor, carrying two teeth. I had seen the operation so often that with the utmost confidence I put myself in his hands. He performed the operation described by Dr. Williams; I was not hurt a particle; the sensation did not correspond to the prick of a pin; I knew simply when it was done. I feel so strongly in favor of this method that, if anything should happen, I would willingly have the opposite tooth cut off for the sake of the comfort. That is my experience.

Dr. GAYLORD: I speak of a somewhat limited experience, not extending over fifty cases. I have performed the operation perhaps that number of times, and I never have had extensive pain.

Dr. SEARLE: Did you try it in your own mouth?

Dr. GAYLORD: I have had the opportunity to verify the thing on the spot. It was done to the delight of the operator and that of the patient.

Dr. BARTHOLOMEW: In the question of crowns, the time it takes to insert one is a very considerable factor. We are all interested in this point. Occasionally we have a patient who will pay almost any price for a piece of work; but what we want, is to know which is the best method for office practice—that is, the method which comes within the reach of most patients. The Richmond crown, as it was demonstrated this morning, is too expensive for general office work; but few persons will come into an office who will pay the price of crowns of that pattern. In reference to the other methods, the questions must be asked, Which is the one that is most practical to use? What would be the amount of time to set one of the teeth? Dr. Bonwill perhaps can tell us, so that we can form some estimate of the average expense.

Dr. BONWILL: Supposing your tooth is an incisor in the lower or upper jaw, or the bicuspid, I do not think it takes longer than two hours, sometimes one hour; but never perhaps more than two hours in a superior or inferior incisor. When you come to the molars, the first molars may take two hours. I can get all the way from $10 to $15—seldom less.

Dr. BARTHOLOMEW: I would like Dr. Hurlbut to give us the time it took Dr. Buttner in setting the crown this morning.

Dr. HURLBUT: That is hardly a fair question. Dr. Buttner comes

from New York to operate before one hundred and fifty men that are to criticise; he comes away from his office, and comes here, and has no conveniences whatever compared with what he has at home. It takes him one and one half hours in his own office, but here he was two hours in selecting a tooth from what teeth we had in the city and he had brought, and then he was not satisfied. He was busy perhaps three hours this morning, counting all.

Dr. BONWILL: One point still! Some persons asked how I would remove the crown when placed on, and when it had become loose. There is no way except to take a corundum wheel and cut through the crown as through glass; also in cases of repair; but if you take a pin of proper size, there is seldom any case necessitating that. The teeth we are making are made interchangeable; you have nothing to do but to remove a portion of the amalgam which had gone into the base of the crown, adjust a new crown and put it on in the same manner as a new one.

Dr. SEARLE: I can readily see the advantage of cutting off the crowns of teeth, but as to the method of driving the pulp to the end of the roots, I remember very well of a man who told me after such an operation he would swear that a broom-stick was run into his head.

Dr. COOLIDGE: Dr. Clark, having just left, did not have the opportunity to make an announcement in regard to the meeting of the American Dental Convention, which meets on the second Tuesday in August. Allow me also to remind you of the meeting which takes place the coming Fall, the first Tuesday in October, namely, the meeting of the N. E. Society, at Providence, R. I.

Adjourned.

THIRD DAY.

The session opened at 8 o'clock, with a clinic by Dr. Bonwill in crown-setting. This was followed by the reading of papers by Drs. J. A. Robinson, E. P. Brown and C. F. Bliven, all of which we expect to publish at an early date. Thus closed one of the most enthusiastic, earnest, and fruitful meetings that it has ever been our pleasure to attend—to report which, in any complete sense, is an imposibility. One must have been present to witness the many little things that are always collateral on such occasions, and listen to the spoken words in order to even approximately appreciate its value. The constant attendance of an unusually large number through the session—with the weather almost unbearably hot—evinced the untiring interest and appreciation of the members, and the hearty vote of thanks at the close to the distinguished gentlemen who had done so much to insure the success of the meeting, was something more than a mere formality.